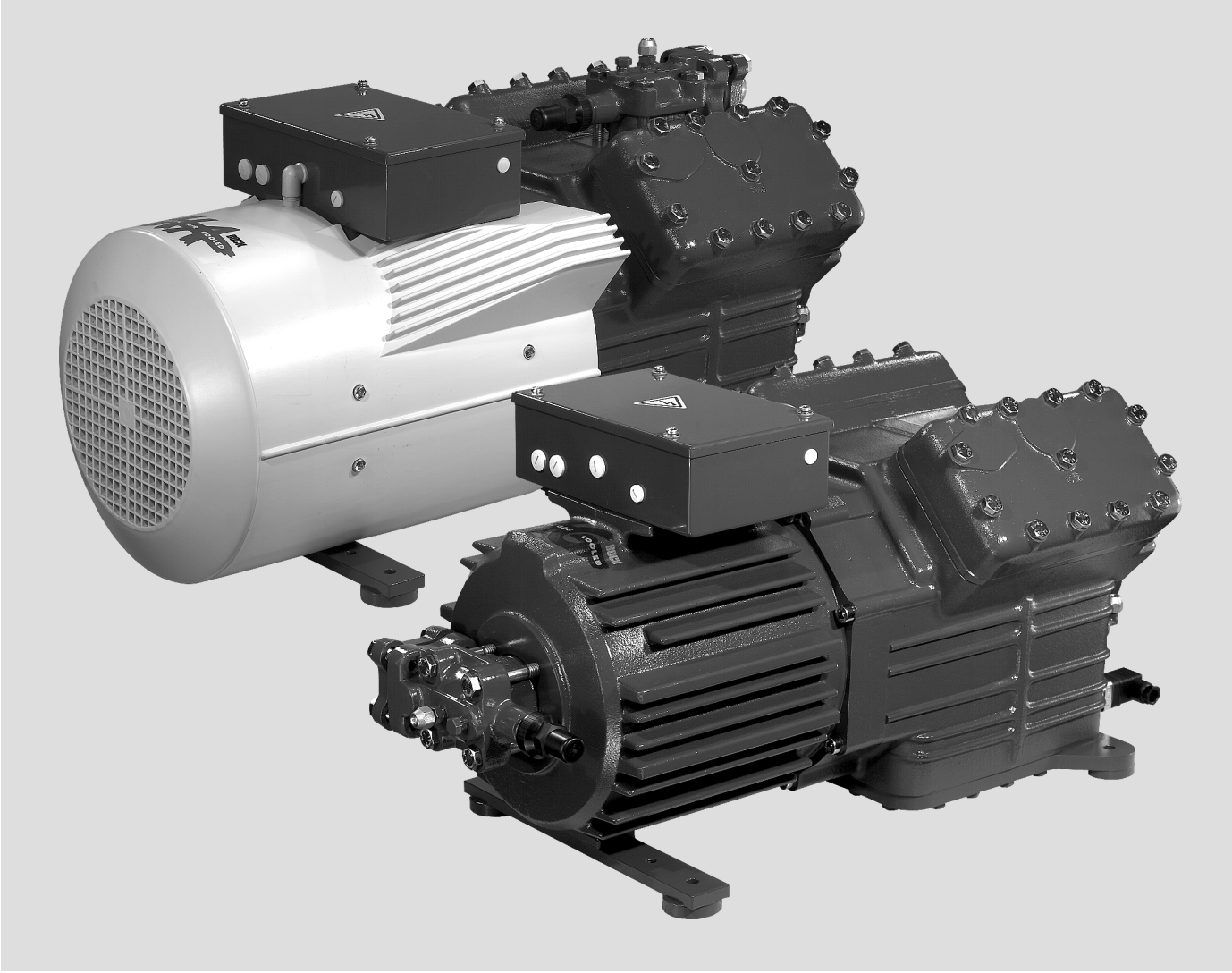
Operating instructions
for semi-hermetic motorcompressors

Type:			
	HA 5/725-4	HG 5/725-4	HG 5/725-4S
	HA 5/830-4	HG 5/830-4	HG 5/830-4S
	HA 5/945-4	HG 5/945-4	HG 5/945-4S



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QUALITY SYSTEM

certified by DQS according to
DIN EN ISO 9001 Reg. No. 2177

CERTIFIED IQNet MANAGEMENT SYSTEM

1. Safety instructions

- Only trained personnel are allowed to handle refrigerating compressors. The local safety regulations as well as accident prevention regulations, technical rules etc. must be observed.
- **Caution!**
  The compressor is under pressure (protective gas).
  "Relieve the pressure" before connection to the refrigerating system or else before starting any work on the unit.
- Observe the max. permissible operating pressure (see nameplate).
- The HA / HG 5 compressor is described in the standard version manufactured by BOCK in the following operating instructions.
- In the case of queries please contact our application engineering department, phone +49 70 22 / 94 54-0 or our representative.

2. Main and functional parts

Type **HA 5**/725-4
HA 5/830-4
HA 5/945-4
(Fig. 1)

Type **HG 5**/725-4 **HG 5**/725-4S
HG 5/830-4 **HG 5**/830-4S
HG 5/945-4 **HG 5**/945-4S
(Fig. 2)

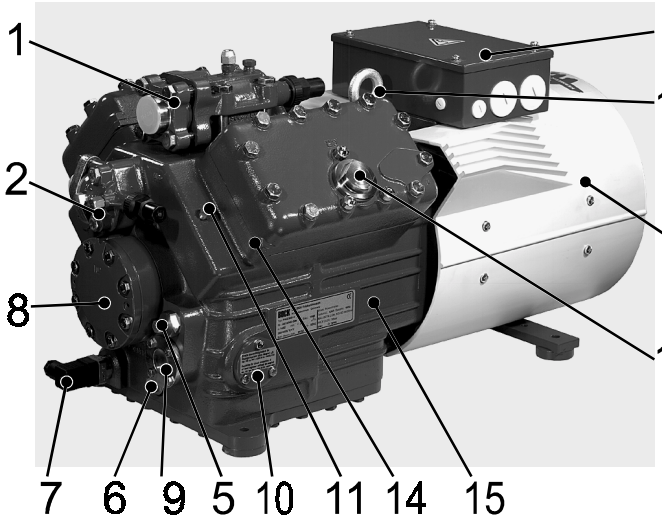


Fig. 1

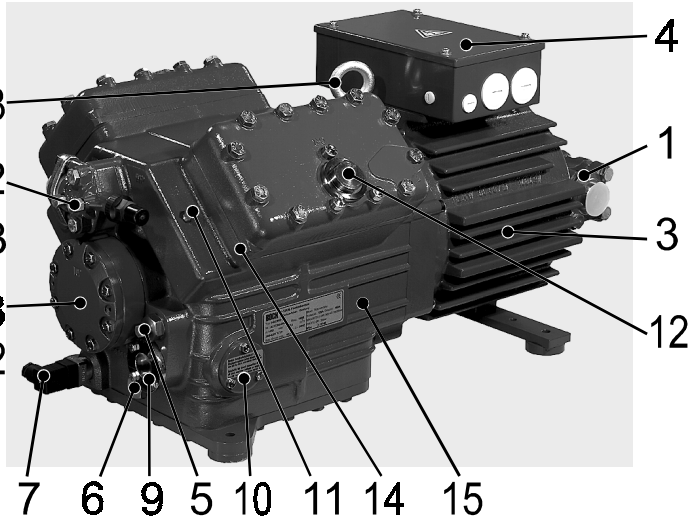


Fig.2

1. Suction shut-off valve
2. Discharge shut-off valve
3. Motor part (air-deflection hood for HA)
4. Electrical connection box
5. Oil filling plug
6. Oil drain plug / oil filter
7. Oil sump heating
8. Oil pump
9. Oil sight glass
10. Connection oil level regulator
11. Connection for heat protection thermostat
12. Connection for capacity regulator
13. Transport eyebolt
14. Valve plate
15. Compressor part

3. Compressor design

Series HA Þ Semi-hermetic air cooled

- Semi-hermetic reciprocating motorcompressor with air-cooled drive motor.
- The suction gas is drawn in directly through the compressor housing.
- The motor is located outside the suction gas stream.
- The motor is cooled by forced external ventilation (by a fan with air baffle). This also means intensified heat transmission of the compressor side which ensures additional reduction of the operating temperatures.

Series HG Þ Semi-hermetic gas-cooled

- Semi-hermetic reciprocating motorcompressor with suction gas-cooled drive motor.
- The refrigerant flow drawn out from the evaporator is conducted over the motor and ensures especially intensive cooling. Thus the motor can be kept at a relatively low temperature level especially under high load.

4. Nameplate

The following data are shown on the compressor nameplate:

1. Type designation
2. Machine number
3. Year of construction
4. Nominal speed
5. Theoretical volume flow rate
6. Voltage, connection, frequency
7. Max. admissible operating current
8. Blocked rotor current
9. Max. admissible operating pressure
10. Protection system
11. Oil brand filled in the factory

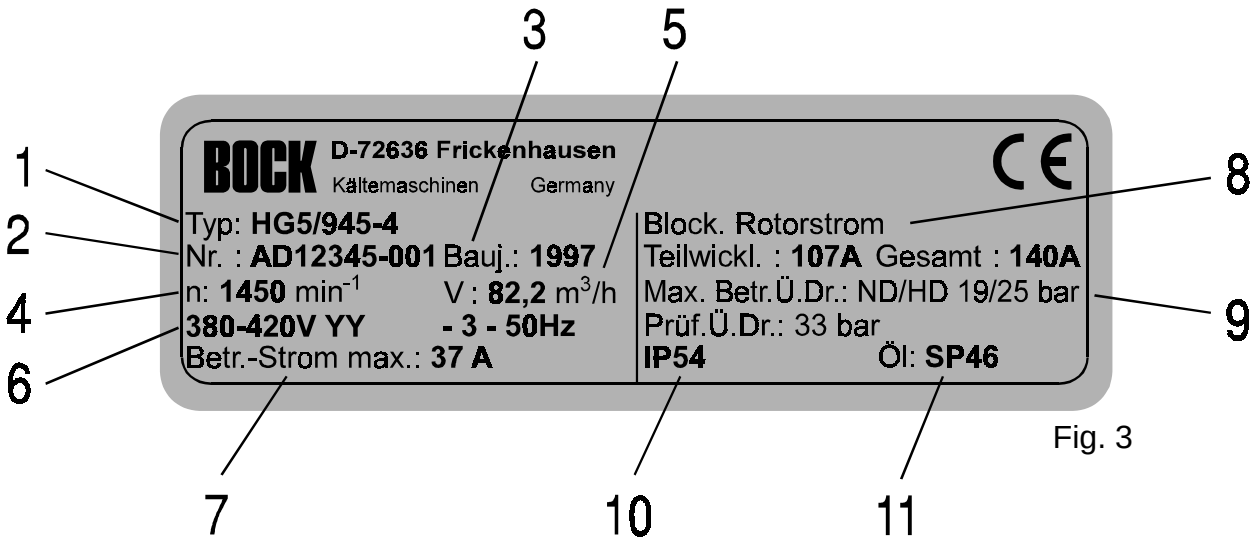
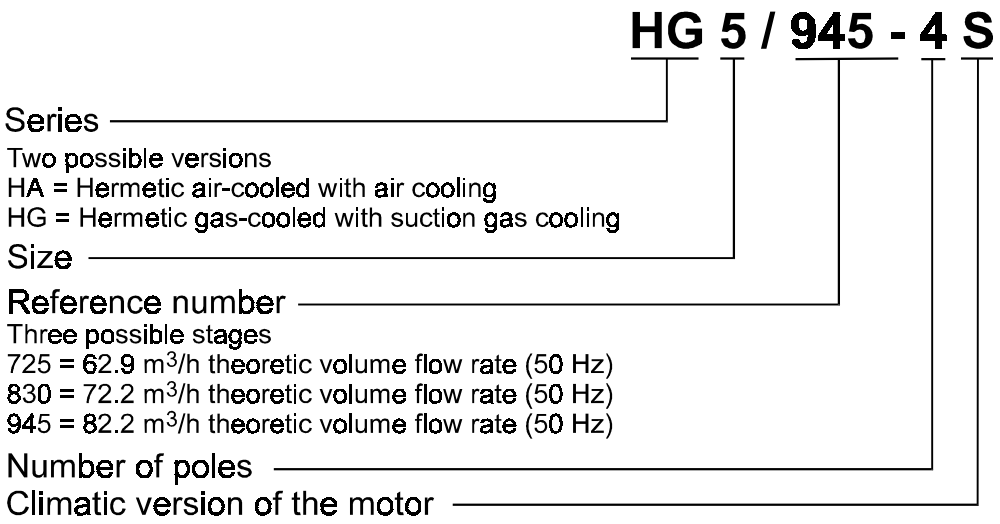


Fig. 3

5. Type code


HG 5 / 945 - 4 S
Series
Two possible versions
HA = Hermetic air-cooled with air cooling
HG = Hermetic gas-cooled with suction gas cooling
Size
Reference number
Three possible stages
725 = 62.9 m3/h theoretic volume flow rate (50 Hz)
830 = 72.2 m3/h theoretic volume flow rate (50 Hz)
945 = 82.2 m3/h theoretic volume flow rate (50 Hz)
Number of poles
Climatic version of the motor

Compressors with ester oil filling in the factory (e.g. for R 134a) are identified with the suffix **X** in the type designation, e.g. HGX 5/945-4.

6. Limits of application

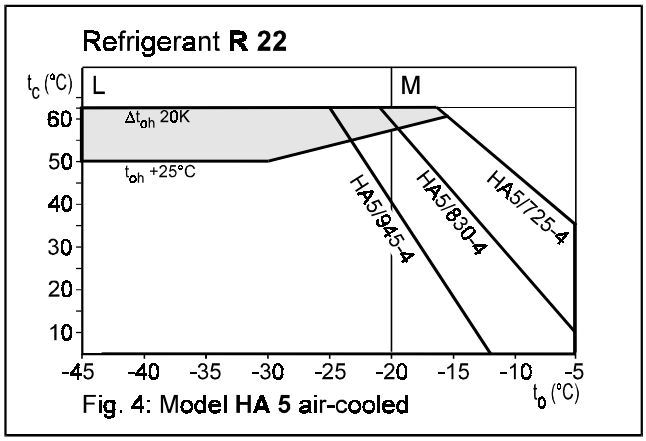


Fig. 4: Model **HA 5** air-cooled

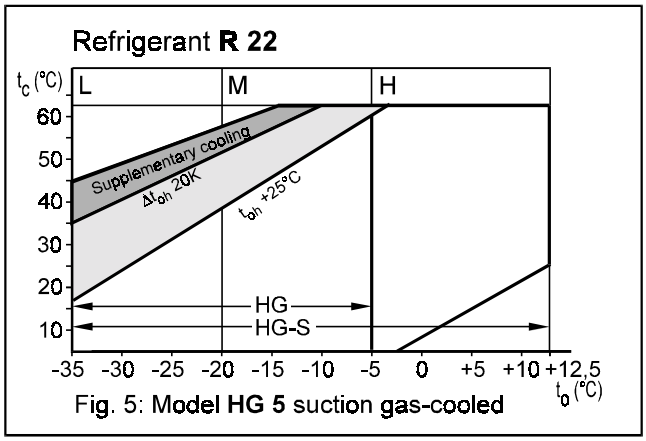


Fig. 5: Model **HG 5** suction gas-cooled

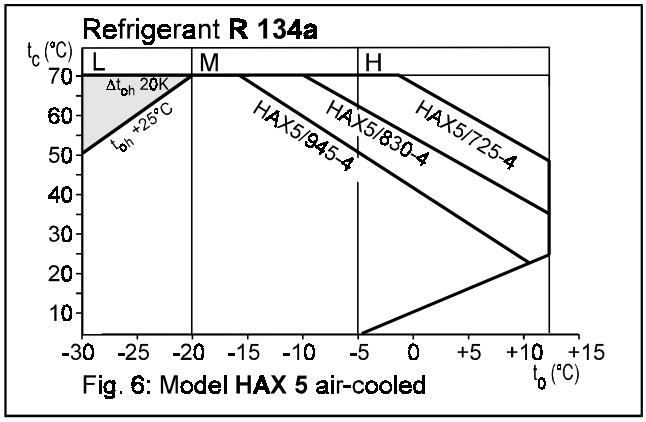


Fig. 6: Model **HAX 5** air-cooled

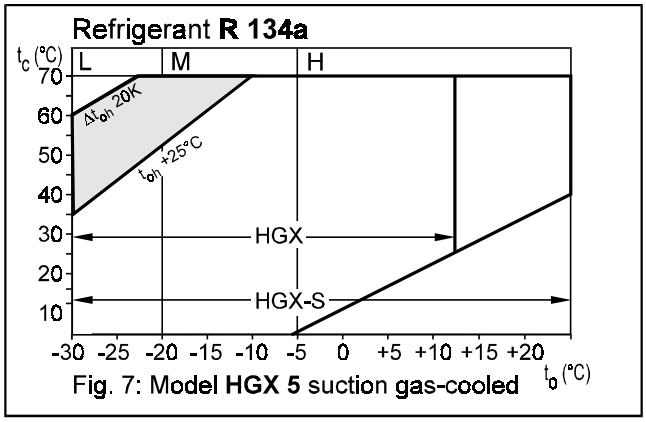


Fig. 7: Model **HGX 5** suction gas-cooled

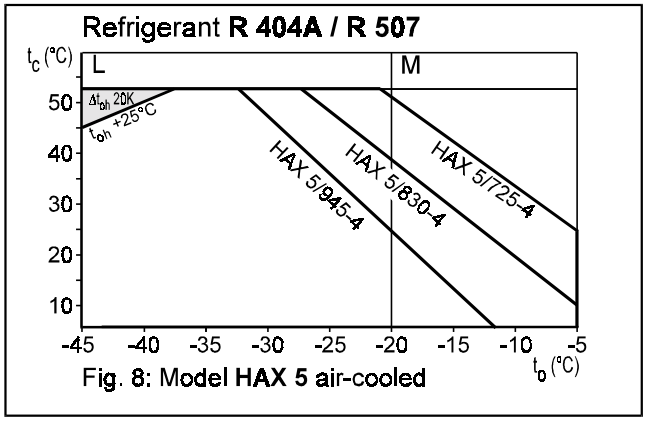


Fig. 8: Model **HAX 5** air-cooled

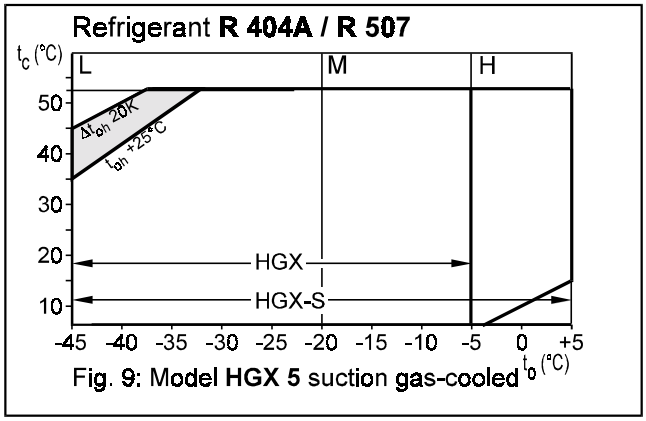


Fig. 9: Model **HGX 5** suction gas-cooled

Reduced suction gas overheating or supplementary cooling

Supplementary cooling generally required

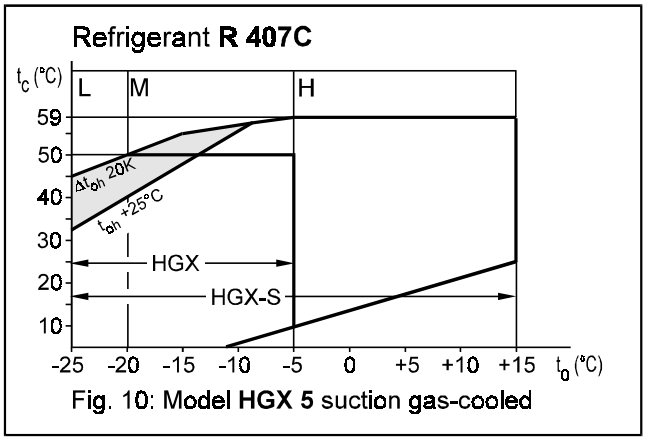


Fig. 10: Model **HGX 5** suction gas-cooled

L = Deep-freeze range
M = Normal range
H = Air conditioning

t_o = Evaporation temperature
t_c = Condensing temperature
t_{oh} 25 °C = Suction gas temperature 25 °C
Dt_{oh} 20K = Suction gas overheating 20 K

Areas and limits of application for other refrigerants on request.

Explanations of Fig. 4 to 10:

The operation of HA/HG 5 compressors is possible in the area shown in the diagrams.

- It is possible to operate without supplementary cooling in the not hatched field. The left limiting line (t_{oh} = +25 °C) is shifted according to suction gas temperature. Two limit curves are indicated for individual definition, t_{oh} = +25 °C and Dt_{oh} = 20 K.
- Reduction of the suction gas overheating or supplementary cooling is required in the light gray field if the discharge end temperature exceeds 140 °C. Compressor operation is possible in the dark field only with supplementary cooling.

  The following can be used as supplementary cooling:
  - Supplementary fan (see Item 11.5)
  - Water-cooled cylinder cover
  - Installation in the condenser flow, air velocity > 2.5 m/sec.

  If operating in the named areas, note the following:
  - The use of a heat protection thermostat (accessory) is recommended.
  - Use only thermally highly stable oils (see lubricants table)
    Recommendation:
    for R 22: Bock standard oil FUCHS Reniso SP 46;
    for R 134a, R 404A, R 407C and R 507: Bock standard oil DEA Triton SE 55.
  - It can be necessary when capacity regulators are used that the compressor must be operated with lower suction gas overheating temperatures. Individual setting required (discharge end temperature of 140 °C must not be exceeded).
  - Operation outside the shown diagrams not permitted.
  - Continuous operation in the limiting area not recommended.
  - Max. permissible ON-OFF switching frequency of the drive motor 12 cycles/h
  - Design for other ranges on request.
- **Only for HA 5 compressors (R 22, R 134a, R 404A, R 507)**
  The HA 5 compressor types have different limits of application because of the air-cooling. These are identified by the inclined limiting lines. Operation on the left of them is possible in each case.

  Important:
  - The vertical limiting lines are designed for + 45 °C ambient temperature (max. permissible).
  - If work is done at a lower ambient temperature, the relevant limiting line is shifted to the right (the range of application of the compressor in increased).

It applies that for every 4 °C ambient temperature reduction, there is a parallel shift of the relevant limiting line by 1 °C evaporation temperature t_0 to the right (into plus).

Information and recommendations on operation with the refrigerants R 22 / R 134a / R 404A / R 407C / R 507 on request.

7. Installation instructions

7.1 General

- Installation of the compressor horizontally on anti-vibration pads (parts kit) or else rigidly if required.
- Provide sufficient free space for maintenance work.
- Provide a spacing from walls of approx. 50 cm for the model HA because of the air-cooling and the possible need to remove the air baffle.
- Direct installation on water-cooled shell and tube condensers only with anti-vibration pads. There is a risk of breakage due to rupture with rigid construction.
- Lift the compressor only at the transport eyebolt, do not use the suction stop valve (HA).
- Transport protection device: In the case of deliveries as a unit, the anti-vibration pads are blocked to avoid transport damage. Remove the transport safety device before starting up (marked with a red sticker).

7.2 Pipe connection / Pipelines

Caution!
The compressor is under pressure (protective gas)
Stop valves should remain closed up to evacuating.

Pipe connections are designed so that pipes in the standard millimetre and inch dimensions can be used. The soldering connection pieces of the shut-off valves must be removed from the shut-off valve for soldering-in the pipes.

Pipelines and plant components must basically be clean internally and dry as well as free of scale, metal chips, rust and phosphate layers. The parts including the hoses must also be delivered closed air-tight.

7.3 Shut-off valves

Caution!
The two shut-off valves (suction gas shut-off valve and discharge shut-off valve) must be open before starting the compressor. See page 3 for the position and arrangement of the valves.

Opening the shut-off valve

a) Turn the spindle 1 to the left (counterclockwise) up to the stop
   Þ Shut-off valve fully opened / service connection 2 closed (position A), fig. 11.

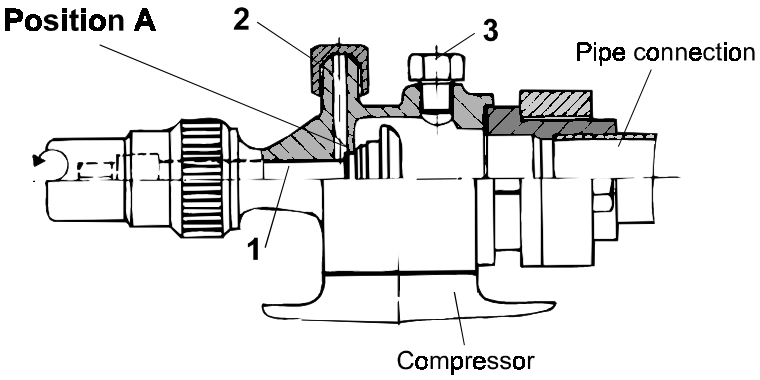


Fig. 11

Opening the service connection (2)

b) Turn the spindle 1: ½ - 1 revolution to the right
   Þ Service connection 2 opened / shut-off valve opened (position B), fig. 12.
   The service connection 3 cannot be shut off (always opened).

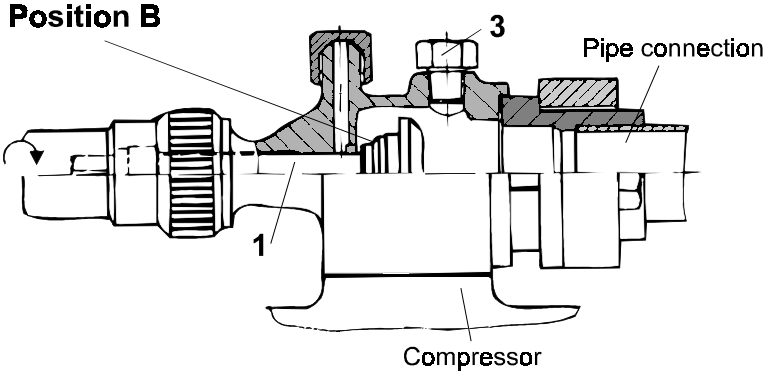
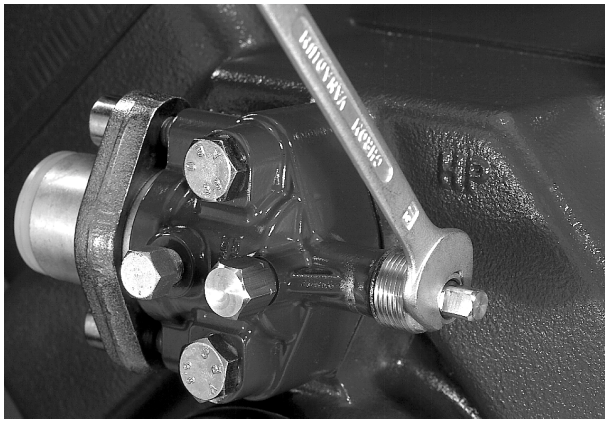


Fig. 12



Remark:
Before opening or closing the shut-off valve loosen the spindle gasket by about 1/4 revolution.
After operating the shut-off valve re-tighten the valve spindle gasket (fig. 13).

Fig. 13

8. Electrical connection

8.1 General notes

The electrical installation must be made according to the schematic wiring diagram (see inside of the terminal box).

Obeserve the local protection regulations.

The maximum operating current must be the basis for dimensioning motor contactors, supply cables, fuses (see compressor nameplate).

Compare the **voltage and frequency data** on the nameplate with the data of the power supply. **The motor may be connected only if there is agreement.**

The motor is connected as standard for part-winding starting. The connection in the terminal box is provided in the factory for **direct starting (YY).** Connect the connection terminals according to the schematic wiring diagram in the terminal box. Delay time on switching over max. 1 second.

8.2 Electronic protective device MP 10

(For description of function see also the enclosure in the terminal box)
The compressor motor is equipped with PTC resistor temperature sensors (motor PTC). The measuring leads are wired with the tipping unit MP 10 which is installed permanently in the terminal box. The unit has a reclosing lock-out. It is unlocked by briefly interrupting the line voltage. To guarantee the locking function, the unit must be placed as first link in the control current chain. The electrical connection must be made exactly according to the circuit diagram (enclosure in the terminal box). If the device trips, the overload or inadmissible operating conditions exist. **Determine the cause.**

WARNING! Terminals 1 - 6 on the electronic trigger MP 10 and terminals PTC 1 and PTC 2 on the compressor terminal board (see diagram) may not come into contact with mains voltage. This would destroy the electronic trigger and the PTC sensors (fig. 14).

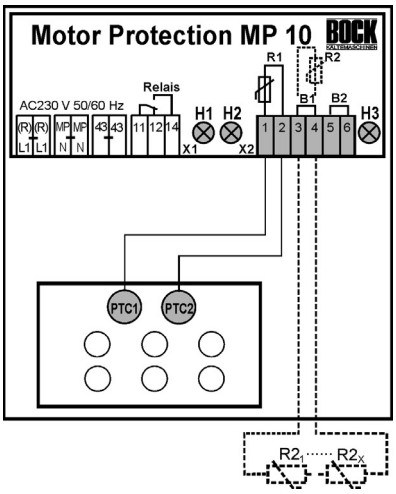


Fig. 14

8.3 Oil sump heating

For description see also DEF-1.39 “Oil sump heating”

During the compressor standstill, refrigerant diffuses into the lubricating oil of the compressor housing depending upon the pressure and ambient temperature. The lubricating ability of the oil is reduced by this. When the compressor starts, the refrigerant contained in the oil evaporates due to the reduction in pressure. The consequences can be oil frothing and oil migration, which lead to oil shocks under certain circumstances.

To avoid damage to the compressor, the compressor types HA 5 and HG 5 are equipped as standard with oil sump heating. The oil sump heating must basically be connected and operated.

Mode of operation:
The oil sump heating is in operation during standstill of the compressor, when the compressor starts, the oil sump heating is switched off.

Note:
The oil sump heating must be connected through an auxiliary contact (or parallel connected auxiliary contactor) of the compressor contactor to a separate current path. Connection to the current path of the safety control chain is not permitted.

Electrical data:
230 V ~ / 140 W

8.4 Fan motor HA

The fan motor for the air-cooling of the compressor is already wired in the terminal box. The power supply as well as control through the compressor contactor must also be provided according to the schematic wiring diagram in the terminal box. The fan motor is protected by a temperature monitor.

Electrical data:
230 V - 1 - 50 ... 60 Hz / 170 W / 0.71 A

9. Commissioning

The compressor has been trial run and tested for all functions in the factory. Special running-in instructions therefore do not have to be followed.

Caution!
The unit is under pressure (protective gas). Relieve the pressure before connection to the refrigerating system or else before starting any work on this unit. Corresponding to the conditions of use, surface temperatures of more than 100 °C on the discharge side and below 0 °C on the suction side can be reached.

9.1 Tightness test, evacuation

- Perform the tightness test of the refrigerating **plant without inclusion of the compressor** (preferably dried with N_2).
- **Now include the compressor** in the following evacuation process (for this purpose open the compressor suction and pressure stop valve, **"pressure relieve previously"**). Evacuate with the vacuum pump on the suction and high pressure side of the system. Vacuum < 1.5 mbar with pump shut off. Repeat the process several times if necessary.
- The system is dry and tight if the pressure rise in the refrigerating system is < 0.5 mbar / 24 h with the vacuum pump switched off.

Caution!
Do not start the compressor in vacuum. Do not supply any voltage - even not for testing purpose (may run only with refrigerant).

9.2 Refrigerant filling

- Before filling, check the oil level in the compressor (it must be visible in the sight glass area and lie above the marking notch, see Fig. 15).
- Make sure once again that the compressor suction and pressure stop valves are opened.
- Filling the refrigerant (break vacuum) with the machine switched off - in liquid from directly into the condenser or collector.
- Start up the compressor. If it is necessary to replenish refrigerant after start-up, this can be filled either in gaseous form in the suction side or - under corresponding precautionary measures - also in liquid form at the evaporator inlet.

Caution!
- **Do not fill in liquid form through the suction stop valve on the compressor.**
- **Mixing additives into the oil and refrigerant is not permitted.**

9.3 Lubrication / Oil check

Check the oil level of the compressor directly after the start.

- Oil level ¼ to ¾ sight glass height (the level should not be below the notch in the sight glass = min. oil level, fig. 15).
- Checking the oil pressure level by means of pressure gauge is possible using a gauge connection with valve (connection position see page 18 - 20). Differential oil pressure desired value 1.5 - 3.5 bar (over the entire operating range)

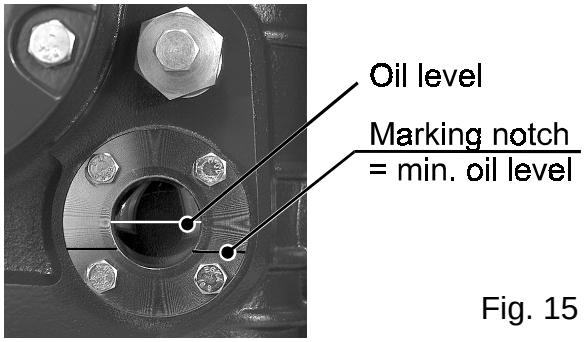


Fig. 15

- Automatic monitoring by differential oil pressure switch. A fault analysis must be performed if the compressor is shut down by the device (observe notes on the cover of the switch).

Caution!
If larger quantities of oil have to be replenished, there is a risk of liquid shocks; the oil return must then be checked.

9.4 Connection oil level regulator

Especially on compound units of several compressors oil level regulation systems proved successful. In order not to block the compressor sight glass by installing the oil level regulator, there is an additional connection on the compressor housing (connection „O“, page 18 - 20).
All common AC&R, ESK oil level regulators as well as the electronic regulation system TRAXOIL S1A1 of SPORLAN can be connected directly without adapter (fig. 16).
A sight glass on the oil level regulator is not necessary.

Connection diagram on the compressor

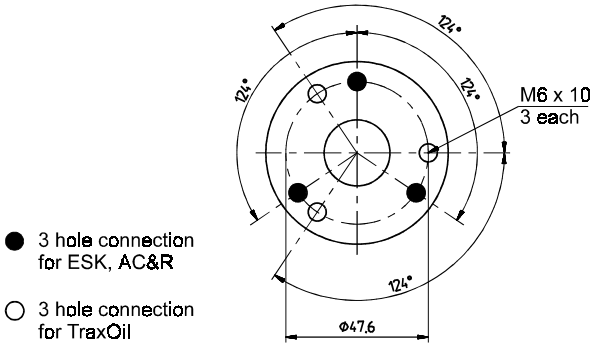


Fig. 16

For further information on compound systems see our leaflet „possibilities for compound systems with BOCK compressors, DEF-1.154“.

Fig. 17

HG 5/945-4 with mechanical oil level regulator (fig. 17).

9.5 Liquid shocks

Observe the following especially to avoid liquid shocks**:**

- The complete refrigerating system design must be **done professionally.**
- All components must be **matched to one another with regard to capacity** (especially evaporator and expansion valve).
- The suction gas overheating at the evaporator outlet should be at least **7 - 10 K** (check setting of the thermostatic expansion valve).
- Especially in critical systems (e.g. with several evaporator points), corresponding measures such as the use of liquid traps, solenoid valve in the liquid line etc. are recommended.

Caution!
Liquid shocks can lead to damage to the compressor.

10. Maintenance

10.1 Safety instructions

Caution!
Before starting any work on the compressor:
- Switch the machine off and secure it against being switched on again.
- Relieve the machine of system pressure.

After maintenance is complete:
- Connect the safety switch and check for function.
- Evacuate the compressor.
- Cancel the reclosing lock-out.

10.2 Service intervals

To guarantee optimum operating safety and life of the compressor, we recommend that the following service and checking work is peformed at regular intervals of time (especially recommended in case of use in the limiting range at high temperature and pressure):

- **Oil change:** For the first time after approx. 100 - 200 operating hours, then once per year.
  Note:
  Dispose of used oil according to the regulations, observe the national regulations.
- **Functional checks: Once per year**, oil level tightness of the compressor, running noise, pressures, temperatures, function of the supplementary devices, such as oil sump heating.

10.3 Spare parts recommendation

The most important spare parts are summarized in the following table:

Compressor type Name	HA 5/725-4 HG 5/725-4 HG 5/725-4S	HA 5/830-4 HG 5/830-4 HG 5/830-4S	HA 5/945-4 HG 5/945-4 HG 5/945-4S
	Art.-No.	Art.-No.	Art.-No.
Gasketkit	08961	08961	08961
Valve plate kit	08851	08851	08851
Oilpump kit	80017	80017	80017
Oilsump heating kit 230 V ~	08426	08426	08426
Solenoid valve kit incl. solenoid coil for start unloader and capacity regulator 230 V ~ /50 ... 60 Hz	08821	08821	08821
Fan HA kit 230 V ~ /50 ... 60 Hz	08630	08630	08630

· **Use only original BOCK spare parts.**

Table 1

10.4 Excerpt from the lubricant table

For partially halogenated CFCs e.g. R22	
Bock series oil brand	**Recommended alternative**
FUCHS Reniso SP 46	CHEVRON Zerol 150 MOBIL SHC 425 SUNOIL Suniso 3GS SUNOIL Suniso 4GS TEXACO Capella WF 46
For fluorocarbons e.g. R134a	
Bock series oil brand	**Recommended alternative**
DEA Triton SE 55	FUCHS E 46 FUCHS E 68 ICI Emkarate RL 46S MOBIL Arctic EAL 46

Further suitable oil brands on request.

Table 2

11. Accessories

11.1 Start unloader

(Special accessory - can also be retrofitted, Art. No. 08981)
For description see also DEF - 1.11 „Start unloader“

The start unloader is integrated in a specially designed cylinder cover in the case of installation in the factory. In the case of retrofitting, it is delivered including cylinder cover and heat protection thermostat. It is required for part-winding start (or Y / D start). A check valve in the pressure line is required for start unloader. The design of the non-return valve must be determined according to the conditions of use.

Caution!

- The start unloader may be effective only during the starting phase (risk of overheating by bypass operation).
- Electrical actuation of the solenoid valve: **Closed deenergized**
- The cylinder covers for the start unloader are designated „SU“ (Start unloader).

11.2 Capacity regulator

(Special accessory - can also be retrofitted, Art. No. 08821)
For description see also DEF-1.10 „Capacity regulator“

The compressor capacity can be adapted to the current refrigerating need by capacity regulator. The capacity regulator works on one cylinder bank, this means a capacity reduction by approx. 50%.
The right cylinder cover (viewed onto the oil pump) is prepared to accept a capacity regulator valve for retrofitting (connection position see page 18 - 20). For this purpose the screw plug M45 x 1.5 must be replaced by the capacity regulator valve.

Caution!

- The gas velocities and pressure conditions of the refrigerating system change in capacity regulator operation: adapt the suction line design and dimensioning accordingly, do not set the control intervals too tight (the steady-state condition of the refrigerating system must arise), continuous operation in the control stage not recommend (uneconomical).
- Electrical actuation of the solenoid valve:
  Opened deenergized (corresponds to 100% compressor capacity).
- The cylinder covers for the capacity regulator are designated „CR“ (Capacity Regulator).

11.3 Oil pressure safety switch

(Special accessory - can also be retrofitted, Art. No. 08920)

When installed in the factory, the switch is fitted and piped directly on the compressor. The electrical connection must be made according to the enclosed description. For retrofitting, the switch is delivered with the corresponding mounting bracket (Connection position see page 18 - 20).

Caution!
Correct running of the pipelines is important because of the risk of breakage.

11.4 Heat protection thermostat

(Special accessory - can also be retrofitted, Art. No. 08921)

A screw-in facility is provided on the hot gas side of the compressor housing for the sensor element. (Connection position see page 18 - 20).
The measuring cable must be wired in series with the motor PTC.
The sensor is already installed and connected in the factory for compressors with start unloader.

11.5 Additional fan, series HG

(Special accessory - can also be retrofitted, Art. No. 80045)

When the HG 5 compressor is used in the deep freezing range (R 22), the operating range can be extended by additional cooling of the cylinder heads (see application limits page 6, fig. 5). The kit is delivered complete with all mounting parts required for installation on the cylinder covers.

Electrical data:
230 / 400 V - 3 - 50 Hz / 120 W / 0.5/0.29 A and
230 / 400 V - 3 - 60 Hz / 180 W / 0.55/0.32 A

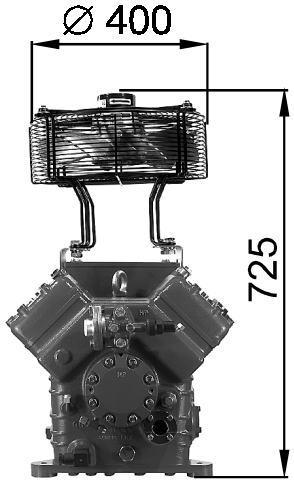


Fig. 18

12. Technical data, dimensions and connections

12.1 HA ...

Technical data	Dim.	HA 5/725-4	HA 5/830-4	HA 5/945-4
Number of cylinders		4		
Cylinder bore	ø mm	70	75	80
Piston stroke	mm	47		
Nominal speed 50 Hz	rpm	1450		
Theoretical volume flow 50 Hz	m³/h	62.9	72.2	82.2
Nominal speed 60 Hz	rpm	1740		
Theoretical volume flow 60 Hz	m³/h	75.5	86.6	98.6
Lubrication				
Pressurized circulating lubrication		Oil pump, independent of direction of rotation		
Oil brand for R 22		FUCHS RENISO SP 46		
Oil brand for R 134a, R 404A, R 407C, R 507		DEA TRITON SE 55		
Oil filling	litre	4.5		
Weight incl oil filling	kg	207	210	213
Electrical data				
Voltage / phases / frequency	V/Ph/Hz	380 - 420 YY / 3 / 50 / 440 - 480 YY / 3 / 60		
Max. operating current	A	26		
Starting current (rotor blocked)	A	107 / 140	126 / 160	126 / 160
Max. perm. operating temperature				
Pressure side HP	bar	25		
Low pressure side LP	bar	19		

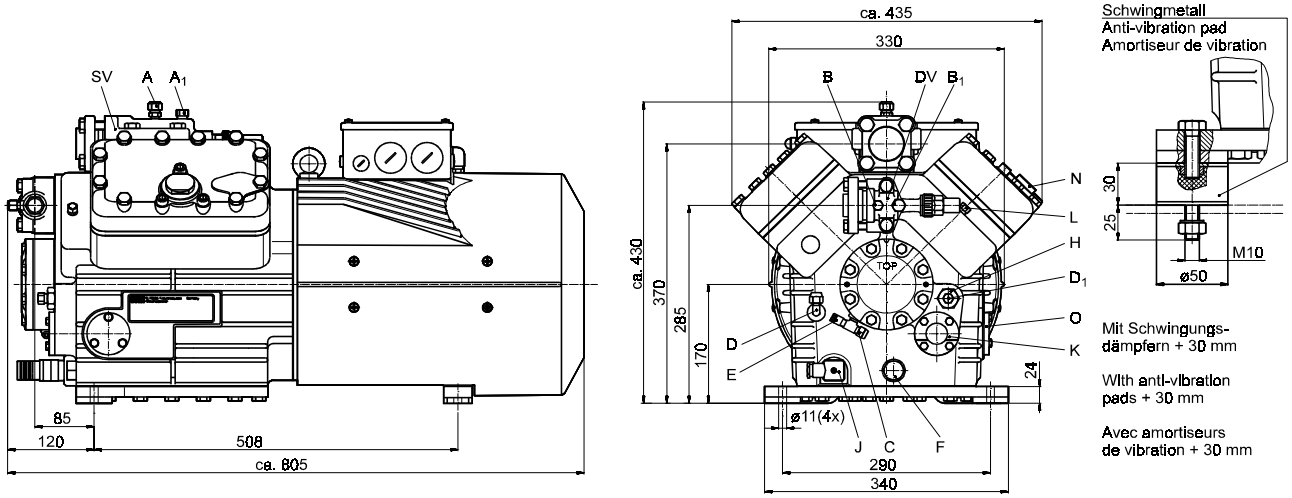


Fig. 19

Connections	Dim.	HA 5/725-4	HA 5/830-4	HA 5/945-4
SV Suction shut-off valve, tube L ø*	mm - inch	42 - 1 5/8"		
DV Pressure shut-off valve, tube L ø*	mm - inch	28 - 1 1/8"		
A Connection suction side, not lockable	inch	7/16" UNF		
A1 Connection suction side, lockable	inch	1/4" NPTF		
B Connection discharge side, not lockable	inch	1/8" NPTF		
B1 Connection discharge side, lockable	inch	7/16" UNF		
C Connection oil safety pressure switch OIL	inch	7/16" UNF		
D Connection oil safety pressure switch LP	inch	7/16" UNF		
D1 Connection oil return from oil separator	inch	1/4" NPTF		
E Connection oil pressure gauge	inch	7/16" UNF		
F Oil drain plug (oil filter)	mm	M 22 x 1.5		
H Oil filler plug	mm	M 22 x 1.5		
J Oil sump heating	mm	M 22 x 1.5		
K Sight glass	-	-		
L Connection heat protection thermostat	inch	1/8" NPTF		
N Connection capacity regulator	mm	M 45 x 1.5		
O Connection oil level regulator	mm	3 x M 6		

*) L = brazing connection

12. Technical data, dimensions and connections

12.2 HG ...

Technical data	Dim.	HG 5/7/25-4	HG 5/7/25-4S	HG 5/8/30-4	HG 5/9/30-4S
Number of cylinders		4			
Cylinder bore	ø mm	70		75	
Piston stroke	mm	47			
Nominal speed 50 Hz	rpm	1450			
Theoretical volume flow 50 Hz	m³/h	62.9		72.2	
Nominal speed 60 Hz	rpm	1740			
Theoretical volume flow 60 Hz	m³/h	75.5		86.6	
Lubrication					
Pressurized circulating lubrication		Oil pump, independent of direction of rotation			
Oil brand for R 22		FUCHS RENISO SP 46			
Oil brand for R 134a, R 404A, R 407C, R 507		DEA TRITON SE 55			
Oil filling	litre	4.5			
Weight incl. oil filling	kg	200	203		208
Electrical data					
Voltage / phases / frequency	V/Ph/Hz	380 - 420 YY / 3 / 50 / 440 - 480 YY / 3 / 60			
Max. operating current	A	33	37	33	49
Starting current (rotor blocked)	A	82 / 107	107 / 140	82 / 107	126 / 160
Max. perm. operating temperature					
Pressure side HP	bar	25			
Low pressure side LP	bar	19			

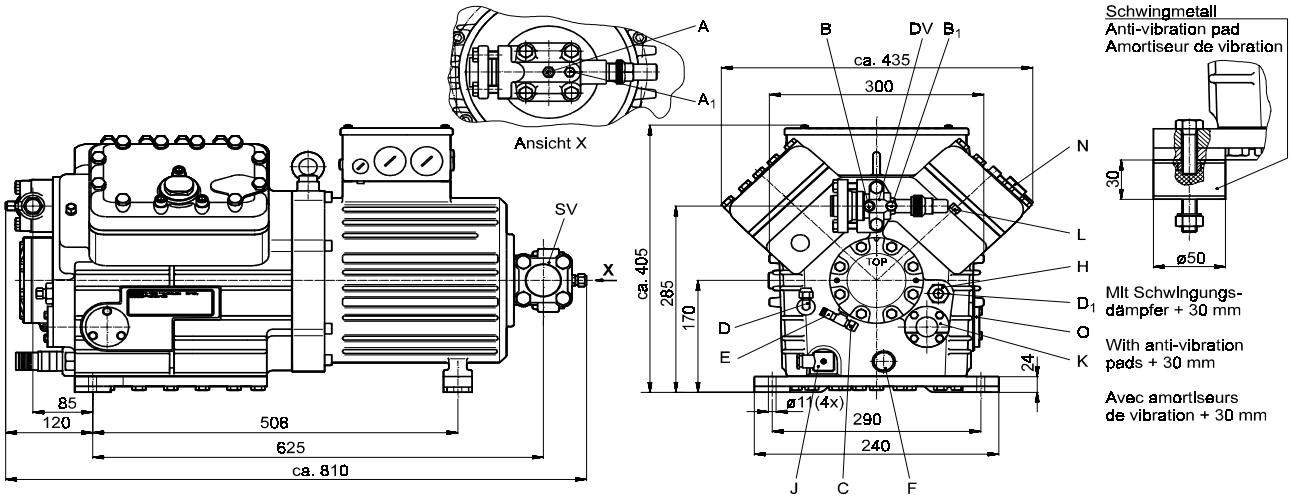


Fig. 20

Connections	Dim.	HG 5/7/25-4	HG 5/7/25-4S	HG 5/8/30-4	HG 5/8/30-4S
SV Suction shut-off valve, tube L ø*	mm - inch	42 - 1 5/8"			
DV Pressure shut-off valve, tube L ø*	mm - inch	28 - 1 1/8"			
A Connection suction side, not lockable	inch	7/16" UNF			
A1 Connection suction side, lockable	inch	1/4" NPTF			
B Connection discharge side, not lockable	inch	1/8" NPTF			
B1 Connection discharge side, lockable	inch	7/16" UNF			
C Connection oil safety pressure switch OIL	inch	7/16" UNF			
D Connection oil safety pressure switch LP	inch	7/16" UNF			
D1 Connection oil return from oil separator	inch	1/4" NPTF			
E Connection oil pressure gauge	inch	7/16" UNF			
F Oil drain plug (oil filter)	mm	M 22 x 1.5			
H Oil filler plug	mm	M 22 x 1.5			
J Oil sump heating	mm	M 22 x 1.5			
K Sight glass	-	-			
L Connection heat protection thermostat	inch	1/8" NPTF			
N Connection capacity regulator	mm	M 45 x 1.5			
O Connection oil level regulator	mm	3 x M 6			

*) L = brazing connection

12. Technical data, dimensions and connections

Technical data	Dim.	HG 5/945-4	HG 5/945-4S
Number of cylinders		4	
Cylinder bore	ø mm	80	
Piston stroke	mm	47	
Nominal speed 50 Hz	rpm	1450	
Theoretical volume flow 50 Hz	m³/h	82.2	
Nominal speed 60 Hz	rpm	1740	
Theoretical volume flow 60 Hz	m³/h	98.6	
Lubrication			
Pressurized circulating lubrication		Oil pump, independent of direction of rotation	
Oil brand for R 22		FUCHS RENISO SP 46	
Oil brand for R 134a, R 404A, R 407C, R 507		DEA TRITON SE 55	
Oil filling	litre	4.5	
Weight incl. oil filling	kg	208	209
Electrical data			
Voltage / phases / frequency	V/Ph/Hz	380 - 420 YY / 3 / 50 / 440 - 480 YY / 3 / 60	
Max. operating current	A	37	49
Starting current (rotor blocked)	A	107 / 140	126 / 160
Max. perm. operating temperature			
Pressure side HP	bar	25	
Low pressure side LP	bar	19	

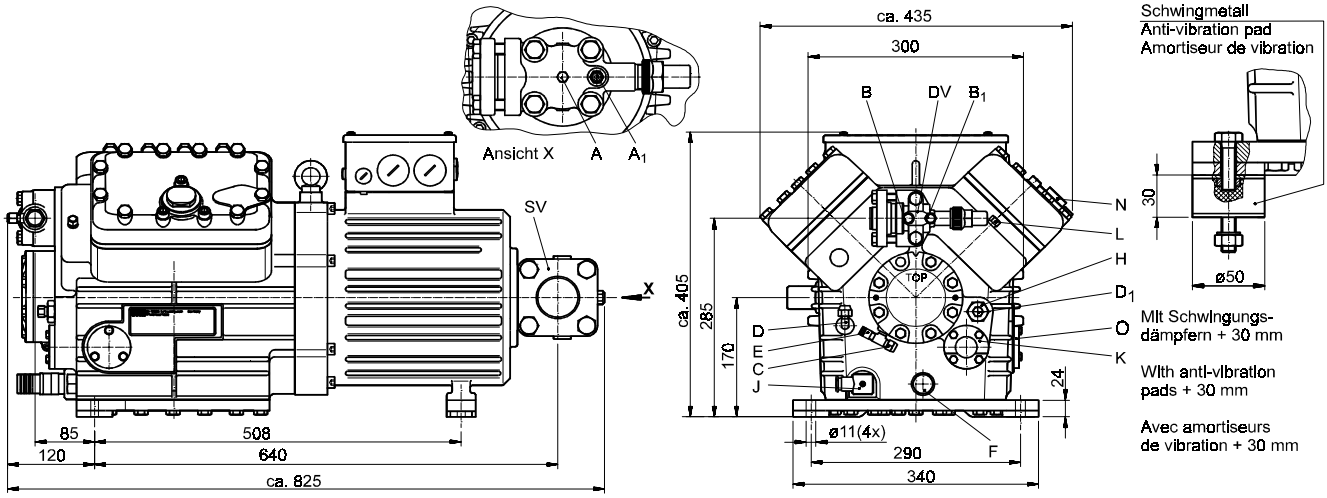


Fig. 21

Connections	Dim.	HA 5/945-4	HA 5/945-4S
SV Suction shut-off valve, tube L ø*	mm - inch	54 - 2 1/8"	
DV Pressure shut-off valve, tube L ø*	mm - inch	35 - 1 3/8"	
A Connection suction side, not lockable	inch	1/4" NPTF	
A1 Connection suction side, lockable	inch	7/16" UNF	
B Connection discharge side, not lockable	inch	1/8" NPTF	
B1 Connection discharge side, lockable	inch	7/16" UNF	
C Connection oil safety pressure switch OIL	inch	7/16" UNF	
D Connection oil safety pressure switch LP	inch	7/16" UNF	
D1 Connection oil return from oil separator	inch	1/4" NPTF	
E Connection oil pressure gauge	inch	7/16" UNF	
F Oil drain plug (oil filter)	mm	M 22 x 1.5	
H Oil filler plug	mm	M 22 x 1.5	
J Oil sump heating	mm	M 22 x 1.5	
K Sight glass	-	-	
L Connection heat protection thermostat	inch	1/8" NPTF	
N Connection capacity regulator	mm	M 45 x 1.5	
O Connection oil level regulator	mm	3 x M 6	

*) L = brazing connection